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Figure 2 shows a front plan view of the perimeter voice coil mounted in the magnet assembly, but with the diaphragm structure omitted for clarity. Figure 3 illustrates a plan view of the same bobbin assembly at an earlier fabrication stage, before forming into a cylinder and winding of the voice coils. In accordance with this aspect of the invention, the bobbin or coil support 30 is formed as a flat sheet or preform 30a, in a shape having a major body substantially or at least equal in length to the circumference of the diaphragm perimeter and the flux gap 25. The preform 30a, has extending arms 31 that each include patterned lead-in conductors 34a, 34b embedded therein. As shown the conductors 34a, 34b resemble conventional circuit board conductive lines and may be formed by a similar process, e.g., a lithographic etching process of a conductive metal film having a suitable current capacity, such as a copper foil. In the illustrated embodiment, the preform 30a has a length C equal to the perimeter circumference, and two lead-in projecting arms 31 are provided at a spacing C/2 for connecting drive power to the voice windings 32a. 32b. When the preform 30a is formed into a closed loop for the cylindrical bobbin, the arms 31 are diametrically opposite, as shown in Figure 3A. This provides a symmetric and balanced centering suspension to further resist eccentric movement when the coil is subject to extreme levels of drive power. As further shown in Figure 3B, the wire windings 32a 32b may be placed on top of each other to substantially fill the gap, while allowing a low-impedance high current voice coil to occupy a relative shallow region in the center of the gap so that the coil experiences a substantially uniform and high flux. By placing a small amount of a magnetic fluid 33a 33b, such as a commercial ferrofluid, on the coil, the faces of the coil are maintained covered with a lubricating and protective film of liquid that also effectively couples flux for efficient actuation of the diaphragm. In other embodiments, the speaker may advantageously have three coils wound with two layers each and connected in parallel to provide lower inductance and lower impedance for improved operation with low voltage power bus equipment. In that case, three sets of lead-in traces are provided, which, as above, are preferably equispaced about the perimeter.

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In addition to the basic broad range speaker design, the invention includes within its scope various embodiments of full range or surround sound systems wherein one or a pair of speakers as described above are employed in conjunction with a sub-woofer to provide a complete sound system having a response extending one to three or more octaves below that of the above-described speaker, yet be driven by a low-voltage source such as a class D amplifier 52 operating from a 3.3, 5, 6, or 12-volt power source. The full-range speaker may itself constitute a console, about the size of a conventional telephone handset, into which semiconductor electronics components have been incorporated, or into which a hand-held device such as a Palm Pilot, MP3 music file player or CD, tape or radio attaches to provide the audio signals which are amplified and played by the console.

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Figure 5 illustrates such a sound system 50. As shown, a pair of small broad range speakers 1 as described above are mounted in a small base unit 40, which may, for example be a desk-top box comparable in size to a telephone or disk drive. The speakers are connected to transduce separate , e.g., left and right sound channels, and a sub-woofer 45 is mounted in a vented recess to transduce low frequency audio. The sub-woofer may be implemented with a substantially similar, but larger diameter design, or a more conventional cone diaphragm construction of larger diameter. With suitable weighting and suspension, this may be as small as a 55 –125 millimeter diameter speaker. The box 40 includes a bay or recess 42 to hold the radio, MP3 device, Palm storage or communications device, or other audio source, and this recess may be a docking recess. In that case, the box 40 preferably includes a suitable charger, optical data coupler and/or other docking support structure for coupling with the intended source device or devices. The box 40 may also contains a suitable network or modem device, conversion circuitry, and amplification circuitry such as the aforementioned class D amplifier 52, so that it both charges or powers the audio source device and provides audio amplification or communication support for audio data stored in the device.